

Green Pesticides for Pest Control – A Comprehensive Experience of Farmers in Bhandara District (M.S), India

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Abstract: *Eco-chemicals isolated from plant parts such as leaves, barks, fruits, seeds etc contribute in production of Green pesticides. Generally, most of the plants have the capacity to produce numerous secondary metabolites which are unpalatable to insect pests. Till today several farmers in Indian villages unknowingly used to collect and prepare crude extract of leaves, seeds and flowers of many plants for pest control. They were in fact not aware of the scientific reason behind it. Farmers belonging to nearby villages of Bhandara are also regularly using some plant extracts as pesticides in vegetable and cereal crops. In view of this, in the present investigation 15 biopesticide potential plants were identified, isolated and mode of preparation of biopesticide were gathered by interaction with local farmers. The mode of preparation of biopesticide and their action on specific pests were discussed in the present investigation.*

Keywords: Eco-chemicals, Green pesticides, Pests, Secondary metabolites

I. INTRODUCTION

Bhandara is an agriculture based district located in the north east part of Vidarbha region of Maharashtra state. The District occupies an area of 4087 km² and has a population of 12,00,334 of which 80.52% are in rural areas (as per 2011 census). Majority of population speak in Marathi (official language of Govt. of Maharashtra) and Hindi, but some communities also speak in Lodhi, Powari and Koshti language. Bhandara district encompasses a large forest cover along with many villages with a vast cover of cultivable fields growing cereals, pulses and vegetables crops.^[21]

Nowadays organic food production along with consumer demand is increasing both in developed and developing countries as well. Synthetic chemical pesticides are known to contaminate food and vegetables which has adverse impact on health of human beings therefore there is an increasing demand of organic food and beverages. Realizing this fact various government organisations as well as NGO's are encouraging farmers to adapt organic farming.

Chemical pesticides have several disadvantages as it targets all organisms irrespective of its good or bad nature, in addition to environmental pollution. Chemical pesticides continues to remain in soil and water for a very long period having adverse impact on flora and fauna and therefore not suitable for organic food production. Pesticides derived from plant sources also called as green pesticides have been used as an alternative to chemical pesticide as they are eco-friendly too. Pests affecting the crops are importantly susceptible to these green pesticides. It has additional benefit of protecting the stored grains as well. The present information is based on field experiences of farmers who used these 15 plant species for controlling varieties of pest, fungal and bacterial diseases. These plant extracts have given better results to great extent without any side effect, mostly in vegetable crops.

Material and Methodology

Bhandara District is an Agriculture based district located in the north east part of state of Maharashtra in India, with an Latitude of 21⁰13'34.5"N and Longitude of 79⁰65'75" E.^[21] The work was carried out adopting the methodology of Jain^[12]. Twenty villages were visited each for duration of one to two days spread over two months. Information of

biopesticide preparation and mode of usage was collected from local farmers and through personal observations simultaneously. Plants were identified taxonomically by using 'Flora of Maharashtra'^[19 & 20]. Marathi names of plants and pests were collected from formers.

Observation and Discussion

Chemical pesticides are dangerous and threat to biodiversity, therefore there is an urgent need to find agent meant for better crop protection along with less harm to environment. The term "green pesticides" entails all naturally acquired types of pest management from plant extracts, plant-derived pesticides, plant secondary metabolites, and plant-based pesticides^[13]. The green pesticides are also referred to as botanical pesticides and are used as repellents, nematicides, insecticides, fungicides, and bactericides, obtained in the form of isolated substances or complex mixtures^[1]. Although there has been significant growth in botanical pesticide research, the commercial availability of these pesticides remains limited^[8].

During the exploration, pest control in different crops surveys were carried out in nearby villages of Bhandara. The utilization of some plant extracts as pesticides was recorded from farmers and village heads by posing questionnaires to them. The communication with these people was in Marathi and Hindi. We arranged well planned programs along with P.G. Students while working on this particular aspect. Frequent field trips were arranged in three successive seasons in all study areas. The main aim of the work was to know the preparation of pesticides from plant resources.

Among the biopesticide information, in some villages of study area, local people are regularly using *Albizia, Blumea, Parthenium, Croton, Carica, Azadirachta, Sapindus, Pongamia, Annona, Sphaeranthus, Vitex, Psidium, Lantana, Tridax and Ocimum* leaf extracts of individual plants (Table) or different combinations of 3 to 5 plant species as a biopesticide in vegetable and cereal crops. The negative effects of synthetic pesticides have created the need for a safer and more environmentally friendly substitute^[9]. Biopesticides are believed to be less toxic, environmentally friendly, and not harmful to humans and non-target organisms^[14]. From very long back, botanical insecticides have been used in agricultural practices by ancient China, Egypt, Greece, and India^[10]. Recently the interest in biopesticides has grown immensely, with the intention to substitute with synthetic pesticides.

Farhana and Sahera revealed that the medicinal weeds are playing the fundamental role in disease control at the cost of pesticides which are acting as biological controlling agents helping the vegetable growers to get rid from synthetic pesticides^[5]. Earlier many researchers worked on pesticide activity of various plant species on different pests diseases, among them Chakraverty and Basu^[2], Dhale^[3], Dwivedi and Bajaj^[4], Mehta et al.^[15] are prominent researchers. On the other hand, the local people are regularly using *Annona* and *Vitex* leaf paste for pest control, similarly *Annona* and *Vitex* leaf paste used for treating wounds and skin diseases^[16]. Sandeep and Srivastava^[17] revealed antifungal property of *Tridax procumbens* against three phytopathogenic fungi. Plants have limitless ability to synthesize aromatic substances, mostly phenols or their oxygen-substituted derivatives^[7]. Most of the natural products are secondary metabolites, these serve as plant defence mechanisms against microorganisms and insects^[6]. Today there is growing interest in chemical composition of plant based medicines, several bioactive constituents have been isolated and studied for pharmacological activities. Generally the plant essential oils and their constituents as active ingredients in bio insecticides^[11]. During the last two decades, the pharmaceutical industry has made massive investment in pharmacological and chemical researches all over the world in an effort to discover much more potent drugs, rather, a few new drugs. Plants have successfully passed the tests of commercial phytochemical screening^[18]. Most of the natural products are secondary metabolites and about 12,000 of such products have been isolated so far^[18]. Campos et al.^[1] revealed the use of botanical insecticides for sustainable agriculture for future perspectives.

II. CONCLUSION

Ethnobotany is virtually a new field of research and if this field is investigated thoroughly and systematically, it will yield results of great value to the ethnobotanists, botanists and ultimately to phytochemists and pharmacologists for further study. In the present investigation, green pesticide preparation from local farmers were gathered. The natives have their own measurements based on either approximate volume of residue or judging the consistency with finger or by other means such as smell, etc. These unknown dosages may create risk to crops. Therefore, the present work is

designed with an objective of providing identification of biopesticide plants, which will be useful for the formulation of novel biomolecules by applying phytochemical screening to get scientific information, which might be helpful for further authentic drug investigation.

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Table: List of Plants used as Bio pesticides by Farmers of Bhandara District

S. No	Scientific Name of the plant	Local Name	Name of pest / Local name	Mode of Preparation of biopesticide
1.	<i>Albizia procera</i> (Roxb.) Bth.	SafedSiras	General Insecticide	1 kg of leaves in 3L. of boiled water. Kept 3 days.
2.	<i>Annonasquamosa</i> L.	Sitaphal	Whiteflies (Paanddharimaashii)	100 gm. Seed paste in 1L. of water or 1Kg of fresh leaves in 3L. of boiled water ,soak overnight.
3.	<i>Azadirachtaindica</i> A.Juss.	KaduNeem	Aphids (HariMakki)	1 kg leaves soaked overnight in 2L. of water.
4.	<i>Blumealacera</i> (Burm.f.) DC.	Kukundarah	Leaf hoppers (Tuddtuddaa) Moths (Patangkitaka)	1 kg leaves soaked overnight in 3L. of water.
5.	<i>Carica papaya</i> L.	Papaya	General Insecticide	1 kg old leaves soaked overnight in 3L. of water.
6.	<i>Croton sparsiflora</i> Morong.	Jungle mirchi	Mealey bugs (Pitthyaakitak)	1 kg leaves soaked overnight in 3L. of water
7.	<i>Lantana camara</i> L.	Tantani	Leaf hoppers (Tuddtuddaa), Mealeybugs (Pitthyaakitak)	1 kg of fresh leaves in 3L. of boiled water.
8.	<i>Ocimum basillicum</i> L.	Sabja	Leaf hoppers (Tuddtuddaa), Mealey bugs (Pitthyaakitak)	50 gm. Leaf paste in 1L. boiled water.
9.	<i>Parthenium hysterophorus</i> L.	Gajarghas	Leaf hoppers (Tuddtuddaa)	1 kg of fresh leaves in 3L. of boiled water.
10.	<i>Pongamiapinnata</i> (L.) Pierre.	Karanj	Leaf hoppers (Tuddtuddaa), Termites (Udhai)	1 kg of fresh leaves in 3L. of boiled water.
11.	<i>Psidium guajava</i> L.	Peru	Mealy bugs (Pitthyaakitak),	1 kg of fresh leaves in 3L. of boiled water.
12.	<i>Sapindus laurifolius</i> Vahl.	Ritha	Mealy bugs (Pitthyaakitak), white ants (Cheeti)	100 gm. of fruits soaked in 2L. of water or 1 kg fresh young leaves in 2L. boiled water.
13.	<i>Sphaeranthus indicus</i> Linn.	Gorakhmundi	White flies (Paanddharimaashii), Mosquitoes (Kala Machhar)	1 kg of whole plant soaked overnight in 3L. of water.
14.	<i>Tridax procumbens</i> (L.) L.	Kamarmodi	Mealey bugs (Pitthyaakitak)	1 kg of whole plant in 3L. of boiled water.
15.	<i>Vitex negundo</i> L.	Nergundi	Mealey bugs (Pitthyaakitak)	1 kg of leaves in 3L. of boiled water. Kept 3 days.